Report for 2003AZ19B: Integrating Research and Education to Assist Watershed Initiatives: A Survey of Three Arizona Watershed Organizations

There are no reported publications resulting from this project.

Report Follows

A. Problem And Research Objectives

Arizona watershed organizations hold great promise for improved water management statewide, but rural communities, the Arizona Department of Water Resources, and Arizona state legislators have identified a need to evaluate the effectiveness of watershed organizations in terms of their capacity to achieve their goals. The Arizona Rural Watershed Initiative was specifically created with a view to supporting local management of water resources, but no tool existed to evaluate the efforts of the various watershed organizations under its umbrella. In addition, Arizona watershed organizations have faced increasing pressures to find water management solutions in a timely manner because of drought[1] and Growing Smarter requirements. Recently state watershed organizations have been looking at each other, especially ones like the Upper San Pedro Partnership, for lessons or models on how to increase their capacity to address water management issues more effectively.

With these needs in mind, our research questions in a general sense are "How do watershed organizations move from being a collection of interests to cooperating on collaborative resource management?" and "How do these organizations find a balance among competing interests and move to the point where they can agree among themselves on: (1) what their mission is, (2) what strategies they use, (3) how they obtain community support, and (4) how they obtain political and economic support for implementing their plans?" One of the characteristics that distinguishes collaborative watershed groups from government agencies is the voluntary network of horizontal actors rather than the hierarchical or vertical arrangement with formal control mechanisms characteristic of government agencies (Imperial and Kauneckis 2004:1012-1013). In terms of decision-making, collaboration is thus a process of social construction where organizations and agencies pool their expertise and resources (Altheide 1988; McGuire 1988). It is the development of the collaborative process that we are examining in the three Arizona watersheds: the Upper San Pedro, Verde, and Santa Cruz River Basins.

The research objective of "Integrating Research and Education to Assist Watershed Initiatives" was to create a pilot survey instrument to assess watershed organizations in Arizona and to test that instrument in the three watersheds. Our intent was that the findings of this survey would benefit not only the watershed organizations themselves in terms of identifying strengths and weaknesses, but also in pinpointing strategies in organizational structure and problem-solving processes that Arizona watershed organizations generally could benefit from.

B. Methodology

1. Watershed Organization Survey

In preparation for constructing the survey instrument, materials on the three Arizona watersheds, specifically agency documents (particularly those of ADWR on watershed initiatives), documents from the organizations themselves, the results of previous watershed surveys from the three basins, and the general literature on watershed organizations were reviewed by the research team. In addition, University of Arizona cooperative extension agents from the three watersheds (Susan Pater in Cochise County,

[1] See Johnson and Murphy, "Drought Settles In, Lake Shrinks and West's Worries Grow.

Jeff Schlau in Yavapai County, and Dean Fish in Santa Cruz County) shared experiences working with their respective watershed organizations on watershed and natural resource issues and provided contacts with watershed organization participants and other watershed stakeholders. The team also reviewed previous fieldwork notes regarding watershed organization meetings and discussions with watershed stakeholders in each of these basins.

Based on this document review, the survey instrument was designed in collaboration with the PIs and the extension agents in each county where the watershed organization was located. During the process of its development, select stakeholders from each basin examined and offered comments on drafts of the survey instrument. The survey was revised and a prototype watershed organization assessment subsequently created.

Members of each of the Arizona watershed organizations were individually surveyed by phone or in person to determine: 1) the nature of basin water issues; 2) management goals and priorities; 3) organizational structure; 4) stakeholder identification and positions; 5) the method of selecting and interpreting scientific and technical information; 6) the nature of stakeholder collaboration within the watershed; 7) the processes of planning and decision-making; 8) the method of leader or facilitator selection, including the qualities of effective leadership; and 9) the method of establishing authority within the regional community. Meeting (audience) participants were also interviewed in order to obtain non-member evaluations of the organizations. This was necessary in order to avoid the bias towards success that has been associated with only interviewing coordinators. Surveying both participants and knowledgeable non-participant observers produces complementary information about group success and function (Leach 2002: 647).

2. Characteristics of Population Sample

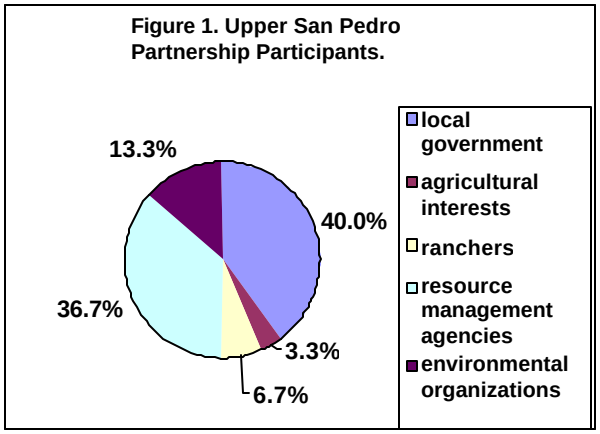
While we initially intended to survey only one organization for each watershed, we found that no one group stood out above the others in terms of its capacity to address the issues specific to that watershed in the cases of the Verde and the Santa Cruz Basins. This left us with the possibility of increasing non-member evaluations or surveying the other organizations within the watershed. Since there were fewer organizations in the Santa Cruz, we decided to survey those groups. With the Verde, the number of organizations has been growing almost monthly, so conducting enough surveys under those conditions was not feasible given the time and costs. Instead, we sought evaluations from a larger number of non-members who regularly attended meetings and were familiar with the Yavapai County Water Advisory Commission (WAC). In each of the three basins we surveyed at least 30 watershed organization participants, including members and non-members, with 30 for the Partnership, 36 for the Verde WAC and 31 total for the Santa Cruz groups (15 for FOSCR, 11 for the SCAMA GUAC, and 5 for the Settlement Group[2]).

San Pedro Basin Participants

Within the surveys from the Upper San Pedro Partnership, 40 percent represented local government, 3.3 percent agricultural interests, 6.7 percent ranchers, 36.7 percent resource

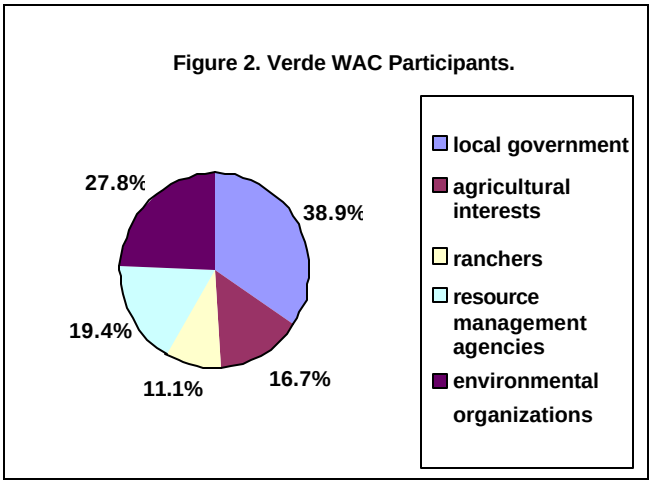
[2] One person was a member of both the GUAC and FOSCR, thus making a total of 30 persons interviewed.

management agencies, and 13.3 percent environmental organizations (see Figure 1). Of those surveyed, 36.7 percent were local (basin) residents. Five respondents (16.6%) were not current USPP members. In regards to length of time participating in the watershed group's activities, 96.7 percent of those surveyed had been participating in Partnership activities since the beginning of the group in 1991.



Verde Basin Participants

Within the Verde WAC, 38.9 percent represented local government, 16.7 percent agricultural interests, 11.1 percent ranchers, 19.4 percent resource management agencies, and 27.8 percent considered themselves representative of environmental interests (see Figure 2). Of those surveyed, 66.7 percent were local residents. For participating in WAC activities, 59.5 percent of those surveyed had been involved for three years or more, with 25 percent for 5 years. Six respondents (16.6%) were non-members.

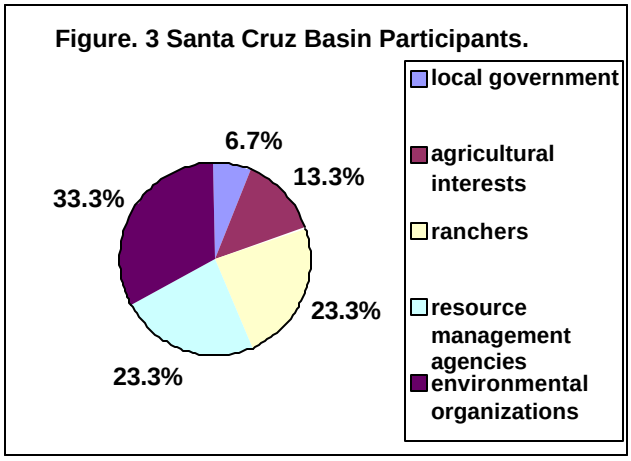


Santa Cruz Basin Participants

The study's thirty-one respondents from the Santa Cruz basin (see Figure 3) were recruited from the meetings of two watershed groups (Santa Cruz Active Management Area Groundwater Advisory Committee (SCAMA/GUAC), the Santa Cruz Settlement Group, the Friends of the Santa Cruz River (FOSCR), and the Santa Cruz River Alliance

(Alliance). Fourteen percent of all respondents from this basin described themselves as members of more than one local group. In addition to this latent permeability of group boundaries, there exists an interest among an apparently significant number of local group members in establishing more formal unions between groups. Given these circumstances—and for the purpose of making inter-basin comparisons—the authors have opted to treat all surveys received from respondents affiliated with one or more of these four Santa Cruz basin groups as originating from a single Santa Cruz 'coalition' of groups.

Within the Santa Cruz groups, 6.7 percent represented local government, 13.3 percent agricultural interests, 23.3 percent ranchers, 23.3 resource management agencies, and 33.3 percent environmental interests. Sixty percent of the Santa Cruz groups were local residents. In all cases respondents could select more than one category indicating their interests. The majority of the Santa Cruz group participants had been involved in their group's activities for 5 years or more.



3. Quantitative Data Analysis

Respondent affiliations and characteristics[3] and the responses to the first section of survey questions[4] (see Appendix A) were entered into a quantitative database (SPSS) and assessed using descriptive statistics and bivariate correlations.[5,6,7] Due to the fact that

[3] Including committee membership, leadership, years of involvement, and representation within a certain watershed group.

[4] These first 31 questions regarded group members' perceptions of a range of issues. Each required the respondent to respond with a number between one (highest/most frequent) and five (lowest/least frequent).

[5] Unless stated explicitly, the reader can assume all correlations to be positive and significant (with p </= 0.05).

[6] Bivariate correlations were calculated using Spearman's rho (for nonparametric distributions) for all possible question-pairs, by basin. All elements were utilized excluding those containing pairs with one or more missing values. Significance was defined as p </= 0.05 in a two-tailed test.

[7] Our decision to not employ inferential statistics was based on a conservative assessment of the potential impact on the validity of results of such procedures in relation to the particular character of our dataset. In particular, the combination of factors—such as sample sizes, variation in response rates, the character of the sampling procedures employed, dependence on ordinal data, and concerns regarding the independence of respondents—required that we responsibly exercise caution.

respondent affiliations and characteristics tended—with the exceptions of "years involved"[8]—to be categorical variables, these were described in terms of their frequency of occurrence among respondents from a given basin. The first battery of survey questions dealt with perceptions regarding watershed group efficacy and character and respondents were asked to express their perceptions as a numeric value associated with a five point Likert scale. Data from these questions were ordinal and could be summarized in terms of frequency of response and frequency-based expressions of central tendency (i.e. median and mode.)[9]

The goal of this analysis was to identify which questions elicited similar patterns of intra-respondent response—i.e. whether, among completed surveys from a particular basin, fluctuations in scores for one question tended to mimic those of another (either by direct or inverse correspondence). By creating a matrix of correlations between all possible combinations of questions, we can map out webs of association between respondent perceptions regarding a variety of issues and, ultimately, better understand the complex significances of these issues for watershed groups and coalitions within and between basins. Such "webs of association" provide guidance in developing hypotheses regarding the nature of the potential relationships between the associated variables that can be evaluated through the employment of more powerful statistical tests and ethnographic methods in larger studies.

4. Qualitative Data Analysis

The final section of the survey includes five open-ended questions dealing with factors for successful leadership, most important projects undertaken, conflicts and conflict management, constraints of water policy in Arizona and suggestions to improve state water policy. The Santa Cruz survey also included an additional question on suggestions for improving cross-border collaboration with Mexico in managing the Santa Cruz River resources. For each question participants had the opportunity to provide multiple responses. In order to evaluate these lists, we looked for key words suggesting thematic categories and concepts and then constructed a coding scheme for them in what Bernard good naturedly calls "the interocular percussion test" where patterns strike the researcher as s(he) reviews the data (Bernard 1995: 201). The results of this qualitative analysis will be presented for each basin.

C. Principal Findings and Results

1. Upper San Pedro Partnership

Organizational Structure

Partnership participants were asked a series of questions about stakeholder representation, participation in discussion and qualities for leadership selection as a

[8] Because this category was subjected to various interpretations by respondents (it was intended to refer to years of involvement with a particular watershed group but was often interpreted as years of involvement in local watershed issues, etc.), its utility as a characteristic of respondents is compromised.

[9] Due to the potential for non-equivalence between intervals on a Likert scale, the operations most valid when analyzing ordinal data are non-computational comparisons, such as <. >, or =.

means of assessing the effectiveness of the group's organizational structure. Partnership respondents evaluated stakeholder representation as average, with the numbers distributed fairly equally on the scale. Stakeholder investment of time, money, or energy (measured individually) was above average. Regarding the leadership selection process, participants were very satisfied with the process and with leadership capacity to mediate conflicts. In addition, members cited stakeholder participation and dedication as the most important factor for successful leadership of the watershed organization. One participant expressed the opinion that success requires "open-minded members willing to risk serious debate on the possible range of issues and methods to mitigate over-consumption." Other salient factors identified were 1) balanced stakeholder representation of all interested parties and 2) collaboration with other resources agencies, the Nature Conservancy, local elected officials, and key political subdivisions. For leadership qualities, knowledge and understanding of scientific and technical issues in the basin and the ability to communicate those to USPP members and to the public were mentioned by one-third of all members. Other important leadership qualities listed by participants are listed in Table 1 below. [10]

Table 1: Most Important Leadership Factors Identified by USPP Members

Leadership Factor	Percent of Respondents
Stakeholder participation and dedication	40%
Balanced stakeholder representation and collaboration	33.3%
Knowledge and understanding of basin issues, including scientific and technical background, and ability to communicate this to a diverse audience	33.3%
Respect, honesty, credibility	20%
Objectivity, fairness and openness to different viewpoints	16.6%
Obtaining funding for project implementation	16.6%
Skills in communication and working with people	13.3%

Decision-making Process

In evaluating the Partnership's decision-making process, respondents rated the group's accomplishment of its mission and its capacity to identify water problems both as relatively high. Likewise, the Partnership's success in addressing basin water problems was rated as high. Participants thought trust among members was also high, as were the strategies to manage conflicts over natural resources. In evaluating the group's use of scientific research to understand basin water issues, members rated the Partnership very high. Partnership participants rated researchers' explanations of their basin work very highly. Understanding scientific research was rated as most important by participants. Actual use of scientific research for management decisions was rated at very high most high.

Project Planning and Implementation

In evaluating the project planning and implementation processes, respondents rated the Partnership's identification of costs and benefits of each project as very high, while they

[10] The percentages at the right represent the percent of total respondents in each basin that gave an answer within the specified category.

cited the Partnership's efforts at identifying project outcomes as average. Furthermore, participants rated the Partnership's decision-making process as average. However, participants rated the Partnership's capacity to implement its projects as very high. On-the-ground activities are considered most important, and actual follow-though on Partnership projects was evaluated very high. Participants evaluated the group's use of monitoring and evaluation results to change project strategies (feedback or adaptive management) as average.

Most Important Projects

Basin resource projects were listed by 53.2 percent of Partnership participants: wastewater effluent recharge projects (in Bisbee and Huachuca City), efforts to work with Mexico, detention basins, purchase of land conservation easements and adoption of the Sierra Vista Water Management Strategy as integral to USPP support of the Biological Opinion goals established by the US Fish and Wildlife Service. Related to the implementation of these projects, members mentioned the importance of process development, organizational structure, water budget development, strategic planning, and obtaining multilevel funding to carry out projects within the basin. Educational outreach, such as Water Wise programs in Fort Huachuca and surrounding communities, public input, and public awareness of the importance of conserving the San Pedro River were also mentioned by 10 percent of respondents (see Table 2).

Table 2: Most Important Projects Undertaken by the USPP

Scientific studies to assess resources	90%
Resource projects (e.g., basin recharge, effluent recharge, wastewater, conservation)	53.2%
Educational and outreach programs for public	10%

Conflict and Collaboration

In terms of conflicts in the San Pedro basin, the most frequent answer given by 43.3% of respondents was the conflicted nature of USPP's role in protecting the river and managing human consumption of water resources. Other conflicts identified by individuals in the study were lack of local control over water, lack of information and misconceptions about what is covered under the Endangered Species Act, USPP process, and regulatory requirements.

At the same time, since collaboration is frequently seen as a means of increasing the political and economic strength of resource organizations, we considered Partnership participants' rating of collaboration and how often they experienced it. Participants considered it very important to most important. However, they evaluated their actual collaboration with other groups as average. This may be because the group already considers itself a collaborative resource management organization, with representatives from every agency level, as well as from the commercial sector and elected representatives. Participants regard those actual efforts at collaboration as average.

Economic, political and institutional (including legislative) forms of support are recognized as essential for the survival of watershed organizations. Partnership

respondents considered economic and political support for their objectives as very high. USPP perspectives about the degree of support from federal, state, or local laws for their objectives were average. However, participants considered existing laws as detrimental or even very detrimental.

Constraints: Arizona Water Policy

The most commonly mentioned constraints (see Table 3) in Arizona's water policy centered on inadequate water laws (66.6%) and the challenges of growth (43.3%). In terms of water laws, four main problems emerged: inability to price water based on consumption, lack of well monitoring, lack of local control of water management and the legal separation of ground and surface water (percentages noted below).

Table 3: Constraints in Arizona Water Policy Identified by USPP Members

Growth and development	43.3%
Inability to price water based on consumption	23.3%
Lack of monitoring unincorporated domestic wells or pumping	20%
Lack of local control of water management	13.3%
Legal separation of ground and surface water	10%

Concerning development issues, nearly one-third (30%) of respondents listed wildcat subdivisions as a major obstacle for water policy. Other specific problems included the "inability to restrict new agricultural use where an insufficient water supply exists or where public interest dictates restriction is necessary," the failure to tie development to water availability and a watershed plan, dense zoning, lack of requirement for developers to produce water demand analyses, and a general "unwillingness to face frankly the necessity to control and limit population, economic development and water consumption" on the part of decisionmakers and community members.

Suggestions for improving Arizona water policy (see Table 4) mainly concerned increasing public outreach and involvement, legislative changes to empower county and local government, regulation of development and requiring water demand analysis by law, and setting scaled water prices based on consumption so that high end users would be charged substantially higher prices. Public education was viewed as a means to improve water policy by inciting citizens to push for legislative change and to elect representatives who are more responsive to water issues.

Table 4: Suggested Improvements to Arizona Water Policy by USPP Members

Increase public education and community involvement	20%
Change laws to empower counties and local authorities	16.6%
Regulate development/growth	13.3%
Set water prices based on consumption	10%

2. Yavapai County Water Advisory Committee (Verde WAC)

Organizational Structure

Verde WAC participants evaluated stakeholder representation as average and stakeholder participation in meeting discussions high. Regarding the amount of time, money or energy spent in participating in WAC activities, participants considered that they contributed very frequently. They assessed the process of leadership selection and leadership management of conflicts as average. When asked to list the five most important factors for successful leadership, WAC participants offered a variety of leadership qualities, which are listed in Table 5 below.

Table 5: Most Important Leadership Qualities Identified by WAC Members

Leadership Factor	Percent of Respondents
Objectivity and fairness	40%
Balanced stakeholder representation and regional vs. local perspective	40%
Knowledge and understanding of basin issues, including scientific/technical background, laws and politics	36.6%
Planning and problem-solving skills	33.3%
Public outreach and education of members	33.3%
Ability to build trust, consensus and compromise	26.6%
Respect and honesty	13.3%
Commitment and dedication	10%

Planning and problem-solving

Under planning and problem-solving skills, responses included the ability to define goals and objectives, long-range planning, innovative ideas and the ability to build consensus around them, decision-making based on fact, project implementation, and willingness to proactively work toward solutions to water issues. In evaluating the WAC's decision-making process, participants felt the WAC was very successful, but they also thought the WAC was experiencing average success with its mission. WAC participants felt their capacity to identify basin water problems was very high. Respondents ranked trust among members and strategies to manage resource conflict above average.

Seen from a process perspective, the WAC very frequently identified the costs and benefits of its projects and project outcomes. WAC participants rated the smoothness of the decision-making process as average and felt they had achieved above average success in building their capacity to implement projects. Participants considered on-the-ground projects very important. WAC participants rated themselves as average or above in following-through on projects. While participants considered the WAC's use of the results of monitoring and evaluation average, some considered the WAC had not reached that stage of their planning and decision-making yet. WAC participants evaluated their success in addressing watershed problems as average or above, but they considered their success in changing water policy or management as average.

Most Important Projects

According to WAC members, the most important projects undertaken have been related to scientific resource assessment in the basin (see Table 6 below). Nearly all participants (86.1%) who answered this question listed at least one science-related project. The most common response, mentioned by 43.3% of respondents, was the USGS aeromagnetic study of Big Chino basin. In addition to scientific studies, education and outreach programs and development of strategies for watershed management were frequently reported, as indicated below. Among strategies mentioned were the regional management plan, the water conservation plan, formation of subcommittees, and the ordinance that mandates the use of effluent for golf courses.

Table 6: Most Important Projects Undertaken by the Yavapai County WAC

Scientific studies to assess resources (e.g., USGS Big Chino Basin study, flow gauges, well monitoring and relationship between surface and groundwater).	86.1%
Educational and outreach programs for WAC members and public	36.6%
Develop watershed management strategies	26.6%
Build partnerships with other agencies (USGS) and groups in region	20%
Forming a collaborative group that brings stakeholders together	13.3%

Conflict and Collaboration

Regarding collaboration, the WAC's attempts to work with other watershed groups was rated average or above. While WAC participants regarded the importance of collaboration as most important, they saw their participation in other watershed groups' activities as average or above. A very high number of WAC participants considered the WAC's collaborations with other groups successful.

Perception of the degree of economic support by WAC members was very high, while political support was viewed as average or above. The group was much more negative in their view of the extent of support from federal, state or local laws; participants saw them as least helpful or unhelpful. This is probably consistent with their view of the detrimental effects of laws on the WAC's objectives and projects; participants regarded laws as very detrimental.

Conflicts experienced in the Verde basin centered on water and land rights, lack of funding, real estate development, political representation, and the WAC's role and authority vis-à-vis the county Board of Supervisors (see Table 7). Many respondents mentioned the conflicts occurring between the Verde Valley and Prescott, which was primarily defined as a "value conflict" in which each area has different opinions regarding pumping the Big Chino basin, land use for recreation and development and the issue of upstream vs. downstream water rights holders and users.

Table 7: Conflicts in Verde Basin

Regulatory requirements for water and land rights	23.3%
Value conflicts between Verde Valley and Prescott	16.6%
Conflict with BOS over the role of the WAC	13.3%
Lack of funding for water issues	6.6%
Unsustainable growth and development	6.6%

Constraints: Arizona Water Policy

Nearly all participants (83.3 percent) who answered the question concerning perceived constraints in current Arizona water policy identified problems with Arizona water laws (see Table 8). Besides legal and policy constraints, WAC members also cited the environmental threats posed by rapid development in the area, most notable the unrestricted "wildcat" developments in Prescott Valley. One member noted that liberal granting of assured water supply certificates to developers fails to take into account that there is not enough water to sustain this pace of growth. In terms of political representation, two members referred to recent political turnover in county representation in the state legislature (which has resulted in increased advocacy for development and growth) as a major constraint as well as the failure of interest groups to come together for the common good.

Table 8 : Constraints in Arizona Water Policy Identified by WAC Members

Inadequate water laws in Arizona	83.3%
Development and growth	33.3%
Lack of public awareness of state water problems	20%
Unequal political representation	13.3%

Respondents from the WAC offered a variety of suggestions (see Table 9 below) for improving Arizona's water policy. Most (60%) concerned legislative or policy changes, such as regulated pumping, control of well monitoring, separation of land and water ownership, and laws requiring review of water resources in light of population growth and water pricing based on consumption. Public education was also viewed as an important means to improve the ethics of water use and consumption and to encourage conservation measures. Finally, respondents identified a need for research concerning the quality of water recharge, minimum stream flows, well data, and new ways to monitor water mining that are quicker and less expensive than drilling. This category was not addressed by members of the USPP.

Table 9 : Suggested Improvements to Arizona Water Policy by WAC Members

Legislative and policy changes	60%
Public education and behavioral change	36.6%
Research and monitoring	13.3%

3. Santa Cruz "Coalition"

Organizational Structure

Santa Cruz participants view stakeholder representation as average, but stakeholder participation in discussions was rated very high. Most considered their participation as average in terms of time, money and energy spent in the groups' activities. Participants also though the leadership selection process was very effective, and leadership's management of conflict very successful. Specific leadership qualities listed by participants emphasized scientific and technical knowledge, communication/management skills, and commitment to the environment with a long-term vision (see Table 10).

Table 10: Most Important Leadership Factors Identified by Santa Cruz Groups

Leadership Factor	Percent of Respondents
Knowledge and understanding of basin issues, including scientific and technical background	43.3%
Skills in communication and working well with people and ability to compromise	36.6 %
Commitment to environment and long-term vision	36.6 %
Objectivity and fairness	20%
Balanced stakeholder representation and collaborative alliances with other groups in area	20%
Confidence, courage, and conflict management skills	16.6%
Organizational skills	16.6%
Commitment of members	13.3%
Public outreach	10%

Decision-making Process

Looking at the decision-making process, Santa Cruz participants decided the group was very highly successful at accomplishing its mission. The group also rated their capacity to identify basin water problems as most high, but only average in its actual success in addressing water problems. Trust among members was evaluated at most high. In their use of strategies to manage conflicts, Santa Cruz participants rated the group's efforts very highly. Regarding the use of scientific research, the participants considered the group's efforts most highly successful and researchers most effective in explaining the results of their basin work. They likewise considered it extremely important that water stakeholders understand such research and very frequently such information was used to make management decisions.

Santa Cruz participants noted that costs and benefits of projects in the decision-making process were identified very frequently, but project outcomes identified with average frequency. They described project implementation as a very smooth part of the decision-making process, but their follow-up on projects as average. They rated their ability to build its capacity for project implementation as average or above. They rated on-the-ground activities as most important for the organization's success and their use of the results from monitoring and evaluation as very frequent. They also evaluated the organization's success in addressing basin water problems as average.

Most Important Projects

In discussing actual projects undertaken, the Santa Cruz participants decided the following were the most important:

Table 11 : Most Important Projects Undertaken by Groups in the Santa Cruz Basin

Scientific studies to assess resources (e.g., water quality and use monitoring, effluent monitoring, measurement of river flows, hydrological modeling).	73.3%
Educational programs for public	60%
Build partnerships with other agencies and groups in area	23.3%
River restoration projects	20%
Clarify land claims (e.g., creating an Inventory of Rights to assist settlement process and guidance on legal issues)	13.3%
Upgrade of effluent ownership under wastewater treatment plan	10%

Conflict and Collaboration

Santa Cruz participants regarded collaboration with other basin groups as most important and considered themselves working with them and attending their meetings on a very frequent basis. They also rated these collaborations as very successful, although some did not chose to evaluate these collaborations. Perceptions of economic support were evaluated as average and political support as very high. SCAMA participants viewed exiting local, state and federal laws as above average in helping advance their objectives and very frequently being detrimental to their objectives and projects.

In terms of conflicts identified in the Santa Cruz basin, the most common response was legal requirements for water and land rights (see Table 12). This includes the issue of assured water supply for real estate development, ownership of water from the international wastewater treatment plant in Mexico, the role of ADWR regarding individual vs. riparian water rights, and conflicts between surface and groundwater rights. Process problems refer to issues arising in the course of determining land and water rights; for example, inaccurate census information and water that is unaccounted for, buying and subdividing lots, and giving water rights to new users (developers) instead of converting existing rights.

Table 12 : Conflicts in Santa Cruz Basin

Legal requirements for water and land rights	63.3%
Process problems	36.6%
Development	16.6%
Effluent from Mexico	13.3%

Constraints: Arizona Water Policy

The most commonly reported problem with existing water laws is the inability of state law to recognize the hydrologic reality and interaction between surface and groundwater (cited by 26.6% of respondents). Respondents also mentioned constraints related to public perception of water issues in the state, such as a lack of long-term perspective and

understanding of drought and conservation on the part of the public and of watershed groups. One person commented that "water policy has been captured by interests of growth and development instead of real science."

Table 13 : Constraints in Arizona Water Policy Identified by Santa Cruz Groups

Unclear, inadequate, or conflicting water laws	50%
Growth and development	13.3%

Suggested legislative and policy changes (see Table 14) were varied and included conjunctive water management, completion of water rights adjudication through the Settlement Group, renewable water banking, starting a fourth management plan and giving water management more authority to move water from one place to another. Another idea offered was to exchange money from the electricity plant in Mexico to pay for Mexican effluent. Increased conservation measures were also deemed important for policy changes.

Table 14: Suggested Improvements to Arizona Water Policy by Santa Cruz Groups

Legislative and policy changes	60%
Public Education and Outreach	20%

As mentioned above, members of the Santa Cruz watershed groups responded to an additional question about collaboration with Mexico. The most common response referred to the Mexican wastewater treatment plant and sales of effluent from the plant. One participant stated, "The main issue for the Santa Cruz basin is the problem with the wastewater treatment plant, especially who pays for a new plant. It is not economical for Mexico to recover treated effluent." Others mentioned the need for better communication with Mexican colleagues through joint meetings and projects, well monitoring and programs in Mexico to reduce river pollution and promote water conservation.

Table 15: Suggested Collaborations with Mexico by Santa Cruz Groups

Expansion of international water treatment plant and sales of effluent from the plant to benefit Mexico	23.3%
Better Communication with Mexico, (including hands-on projects, attending Mexican meetings, creating a binational water agreement, and working with school children).	20%
Well monitoring in Mexico	6.6%
Conservation programs and pollution reduction in Mexico	6.6%

Conclusions

Developing the Collaborative Process: Lessons Learned

The history of watershed organizations in this study indicates that collaboration is a process that requires gaining trust among members, agreeing on the nature of the problem(s), having the capacity to bring resources (technology, science, funding, political and economic support) to the table, and a basic knowledge about basin hydrology and water laws. Much of this process revolves around obtaining "collaborative know-how" or

learning how to "cooperate and work with organizations that have different values, procedures and processes" (Imperial and Kauneckis 2004: 1049)

- Existing Arizona water law provides confusing guidelines in regards to the relationship between ground and surface water. This makes water resource management difficult because ground and surface water are not treated as a coherent hydrological system under the law.
- Balancing the water needs of industrial, residential, and municipal interests in even middle-sized communities such as Sierra Vista and Prescott is challenging enough, but adding ranching and agricultural interests (or upstream vs. downstream users) makes balancing a water budget on a basin scale a long term and complex process because of water data needs and the implications of scientific research.
- Growing Smarter/Plus and AMA legislation have provided strong incentives for watershed groups to learn how to construct water budgets, but they do not guarantee equitable distribution of water.
- As Glennon notes, prior appropriation transforms water from a shared common resource into property. Water use based on right rather than need and heavy dependence on groundwater have contributed to the state's aridity and heightened the need to locate new sources of water (Glennon 2002: 16-17, 31).
- The degree to which watershed organizations are successful in addressing water basin problems depends largely on 1) the group's capacity to identify water basin problems, 2) building its capacity to implement projects (through obtaining resources and knowledge), 3) investing stakeholder time, money and energy, 4) interpretation and use of scientific research findings to make water management decisions, 5) leadership's successful management of conflict, and 6) access to economic and political support.
- Building trust among group members is essential in managing conflict, which in turn contributes to efficient implementation of projects. This trust-building usually starts with framing the issue or problem, which "limits the potential outcome and plays an important role in who has a legitimate case for membership in the collaboration" (Phillips et al, 2000: 6).
- Objectivity and fairness, along with a scientific background, communication skills, respect and honesty, are essential for effective leadership. However, one of the requirements of fairness is balanced stakeholder representation.
- Scientific studies to assess water resources are the most important project of watershed groups, although educational outreach programs and building partnerships with other agencies or groups are also very important.
- Growth management vs. managing human water consumption is the greatest source of conflict in watershed basins, although the legal and regulatory requirements for water and land rights promote conflict among stakeholders as well. These are both regarded as the biggest constraints on Arizona water policy.
- These latter constraints could best be remedied by changing Arizona water laws, including those laws regarding local control of resource management, and by increasing public education and outreach regarding basin hydrology and water use.

- If watershed groups are to become the new form of water management, then they must have access to the power to make decisions crucial to the collaboration, including the authority to implement projects and programs. Effecting changes in water resource management requires that collaborators have power in the water resource arena from the start (Phillips et al 2002:11).

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